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THE BRIDGES

1) SCOPE

The plate load test is a field test, which is performed to determine the ultimate bearing capacity of the soil and the probable settlement under a given load. This test is very popular for the selection and design of the scaffolding arrangements, shallow foundation and crane's placing area. Plate load test is most suited for sands and clay's.

2) The advantages of Plate Load Test

- Time and cost-efficient.
- Being able to understand the foundation behavior under loading conditions.
- Evaluation of bearing capacity of soil at a certain depth and prediction of settlement for a certain load.
- Calculation of scaffolding intervals for supporting arrangements.
- In lifting work, before placing the crane to work conforming the bearing capacity and making suitable arrangement.
- Shallow foundation can be calculated considering the allowable bearing capacity, which can be predicted from the plate load test.
- Easy to perform.
- Reliable.

3) Reference Documents

IS 1888 METHOD OF LOAD TEST ON SOILS

4) Plate Load Test Equipment

- Test plate
- Hydraulic jack & pump
- Reaction beam or reaction truss
- Dial gauges, Pressure gauge
- Necessary equipment for the loading platform.

5) Plate Load Test Procedure

- Excavate test pit up to the desired depth. The pit size should be at least 5 times the size of the test plate.
- At the center of the pit, a depression is created. The size of the depression is the same as the size of the steel plate. The bottom level of the depression should correspond to the level of the actual foundation.
- A mild steel plate is used as a load-bearing plate whose thickness should be at least 25 mm thickness and size may vary from 300 mm to 750 mm. The plate can be square or circular. Generally, a square plate is used for square footing and a circular plate is used for circular footing.
- A column / jack is placed at the center of the plate. The load is transferred to the plate through the centrally placed column.
- The load can be transferred to the column either by gravity loading method or by jacking

Figure: Test Setup for Plate Load Test by kentledge

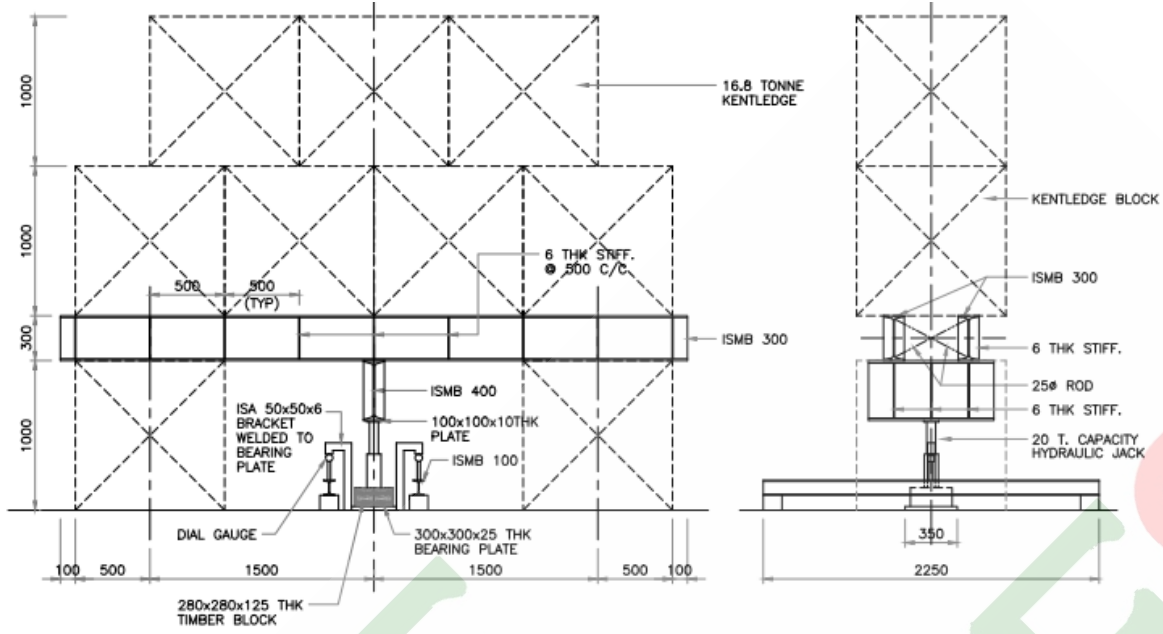


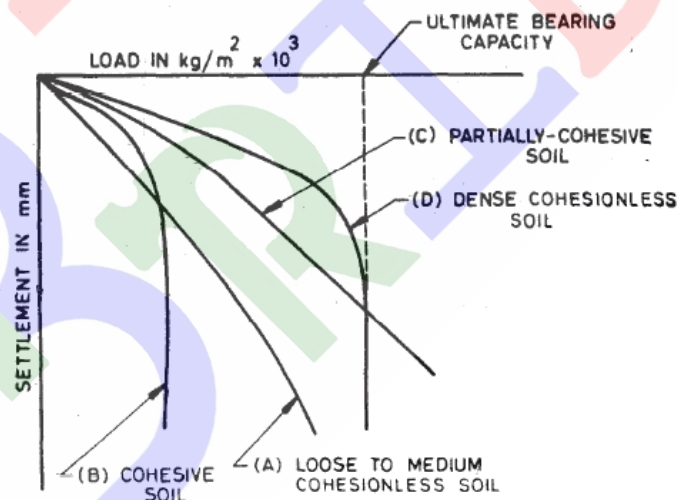
Figure: Test Setup for Plate Load Test by heavy equipment's



- For gravity loading method a platform is constructed over the column and load is applied to the platform by means of sandbags or any other dead loads. The hydraulic jack is placed in between column and loading platform for the application of gradual loading. This type of loading is called reaction loading.
- At least two dial gauges should be placed at diagonal corners of the plate to record the settlement. The gauges are placed on a platform so that it does not settle with the plate.
- Apply seating load of 70 gm/cm^2 and release before the actual loading starts.
- The initial readings are noted.
- The load is then applied through the hydraulic jack and increased gradually. The increment is generally one-fifth of the expected safe bearing capacity or one-tenth of the ultimate bearing capacity or any other smaller value. The applied load is noted from the pressure gauge.
- The settlement is observed for each increment and from dial gauge. After increasing the load-settlement should be observed after 1, 4, 10, 20, 40, and 60 minutes and then at hourly intervals until the rate of settlement is less than $.02 \text{ mm per hour}$. The readings are noted in tabular form.
- The test shall be continued till a settlement of 25mm under normal circumstances or 50mm in special cases such as gravel, sand mixture, is obtained or till failure occurs, whichever is earlier. Alternatively where settlement does not reach 25mm , the test should be continued to at least 2 times of estimated design load. If needed rebound observations may be taken while releasing the load.

6) Determination of Bearing Capacity

After the collection of field data, the load-settlement curve is drawn. It is a logarithmic graph where the load applied is plotted on X-axis and settlement on Y-axis. From the graph, the ultimate load for the plate is obtained which is the corresponding load for settlement of one-fifth of the plate width.



When the points are plotted on the graph, the curve is broken at one point. The corresponding load to that breakpoint is considered to be the ultimate load on the plate. The ultimate bearing capacity can be calculated from the ultimate load from the plate. The ultimate bearing capacity is then divided by a suitable factor of safety to determine the safe bearing capacity of soil from the foundation.

7) Bearing Capacity Calculation



Ultimate Bearing Capacity = Ultimate Load for the Plate.



Safe bearing capacity = Ultimate Bearing Capacity / Factor of Safety

Typically, the range for the factor of safety varies from 2 to 3.

